

Agricultural Research Institute, Pusa

**Agricultural Implements and Machinery at Pusa
Part II**

**Harvesting and Threshing Implements and
Machinery**

BY

G. S. HENDERSON, N.D.A., N.D.D.

Imperial Agriculturist, Pusa

AND

ARJUN SINGH, L.Ag.

Assistant to Imperial Agriculturist, Pusa



CALCUTTA: GOVERNMENT OF INDIA
CENTRAL PUBLICATION BRANCH
1929

Price As. 6 or 8d.

**Government of India Publications are obtainable from the Government of
India Central Publication Branch, 3, Government Place, West,
Calcutta, and from the following Agents :—**

EUROPE.

**OFFICE OF THE HIGH COMMISSIONER FOR INDIA, 42, GROSVENOR GARDENS, LONDON, S.W. 1.
And at all Booksellers.**

INDIA AND CEYLON : Provincial Book Depôts.

MADRAS:—Superintendent, Government Press, Mount Road, Madras.
BOMBAY:—Superintendent, Government Book Depôt, Town Hall, Bombay.
SIND:—Library attached to the Office of the Commissioner in Sind, Karachi.
BENGALEE:—Bengal Secretariat Book Depôt, Writers' Buildings, Room No. 1, Ground Floor, Calcutta.
UNITED PROVINCES OF AGRA AND OUDH:—Superintendent of Government Press, United Provinces of Agra and Oudh, Allahabad.
PUNJAB:—Superintendent, Government Printing, Punjab, Lahore.
BURMA:—Superintendent, Government Printing, Burma, Rangoon.
CENTRAL PROVINCES AND BERAR:—Superintendent, Government Printing Central Provinces, Nagpur.
ASSAM:—Superintendent, Assam Secretariat Press, Shillong.
BIHAR AND ORISSA:—Superintendent, Government Printing, Bihar and Orissa, P. O. Gulzarbagh, Patna.
COORG:—Office of the Chief Commissioner of Coorg, Bangalore.
NORTH-WEST FRONTIER PROVINCE:—Manager, Government Printing and Stationery, Peshawar.

Thacker, Spink & Co., Calcutta and Simla.
W. Newman & Co., Ltd., Calcutta.
R. Cambay & Co., Calcutta.
S. K. Lalrli & Co., Calcutta.
The Indian School Supply Depôt, 809, Bow Bazar Street, Calcutta.
Butlerworth & Co. (India), Ltd., Calcutta.
Rai M. C. Sarcar Bahadur & Sons, 90-92A, Harrison Road, Calcutta.
Standard Literature Company, Limited, Calcutta.
Association Press, Calcutta.
Chukervetty, Chatterjee & Co., Ltd., 13, College Square, Calcutta.
The Book Company, Calcutta.
James Murray & Co., 12, Government Place, Calcutta. (For Meteorological Publications only).
Ray Chaudhury & Co., 68-5, Ashutosh Mukerji Road, Calcutta.
Scientific Publishing Co., 9, Taltolla Lane, Calcutta.
Chatterjee & Co., 204, Cornwallis Street, Calcutta.
B. C. Basak, Esq., Proprietor, Albert Library, Dacca.
Mittra Brothers, Rajshahi.
Higginbotham, Madras.
P. K. Rama Iyer & Co., Madras.
Rochouse and Sons, Madras.
G. A. Nateson & Co., Publishers, George Town, Madras.
Theosophical Publishing House, Adyar, Madras.
Bright & Co., Trivandrum.
The Booklover's Resort, Talkad, Trivandrum, South India.
R. M. Gopalakrishna Kone, Putumandapam, Madras.
Central Book Depôt, Madras.
Vijapur & Co., Vizagapatam.
Thacker & Co., Ltd., Bombay.
D. B. Taraporevala, Sons & Co., Bombay.
Sunder Pandurang, Bombay.
Ram Chandra Govind & Sons, Kalbadevi Road, Bombay.
N. M. Tripathi & Co., Booksellers, Princess Street, Kalbadevi Road, Bombay.
New & Secondhand Bookshop, Kalbadevi Road, Bombay.
Mrs. Radhubal Atmaram Sagoo, Kalbadevi Road, Bombay.
A. H. Wheeler & Co., Allahabad, Calcutta and Bombay.
R. Govind & Co., Sandhurst Road, Girgaum, Bombay.
Proprietor, New Kitabkhana, Poona.
The Manager, Oriental Book Supplying Agency, 15, Bhukarwar, Poona City.
Rama Krishna Bros., Opposite Vishrambag, Poona City.
S. F. Bookstall, 21, Budhwar, Poona.
Mangaldas & Sons, Booksellers and Publishers, Chhava Tolan, Surat.
The Standard Book and Stationery Co., 32-33, Arbab Road, Peshawar.

R. B. Unadkar & Co., The Bharat Book Depôt, Dhulewar.
The Standard Bookstall, Karachi, Quetta, Delhi, Murree and Rawalpindi.
The Karachi Book Depôt, Elphinstone Street, Camp, Karachi.
The English Bookstall, Karachi.
The Standard Bookstall, Quetta.
U. P. Malhotra & Co., Quetta.
J. Ray & Sons, 43 K. & L, Edwardes Road, Rawalpindi, Murree and Lahore.
The Standard Book Depôt, Lahore, Nainital, Mussoorie, Dalhousie, Ambala Cantonment and Delhi.
N. B. Mathur, Supdt., Nazir Khan Hind Press, Allahabad.
The North India Christian Tract and Book Society, 15, Clive Road, Allahabad.
Ram Dayal Agrawal, 184, Katra, Allahabad.
The Indian Army Book Depôt, Jubb, Cawnpore.
The Indian Army Book Depôt, Jullundur City.
Manager, Newal Kishore Press, Lucknow.
The Upper India Publishing House, Ltd., Literature Palace, Ammuddaula Park, Lucknow.
Rai Sahib M. Gulab Singh & Sons, Mudd-4-Am Press, Lahore and Allahabad.
Rama Krishna & Sons, Booksellers, Anarkali, Lahore.
Puri Brothers, Booksellers and Publishers, Katchori Road, Lahore.
The Tilak School Bookshop, Lahore.
The Standard Bookstall, Lahore.
The Proprietor, Punjab Sanskrit Book Depôt, Sathimilla Street, Lahore.
The Insurance Publicity Co., Ltd., Lahore.
The Punjab Religious Book Society, Lahore.
Manager of the Imperial Book Depôt, 63, Chandel Chowk Street, Delhi.
Kuno Book Agency, New Delhi.
Oxford Book and Stationery Company, Delhi.
Supdt., American Baptist Mission Press, Rangoon.
The Modern Publishing House, Ltd., 30, Phayre Street, Rangoon.
Burma Book Club, Ltd., Rangoon.
Manager, The "Hitavada," Nagpur.
Bhishay Brothers, Booksellers and Stationers, Sitabaldi, Nagpur.
S. C. Talukdar, Proprietor, Students & Co., Cooch Behar.
The Manager, Ceylon Observer, Colombo.
The Manager, The Indian Book Shop, Benare City.
The Sivilliputtur Co-operative Trading Union, Ltd., Sivilliputtur (S. I. B.).
Baghunath Prasad & Sons, Patna City.
The Students' Emporium, Patna.
K. L. Mathur & Bros., Gazi, Patna City.
Dandekar Brothers, Indore City.
Pustakalaya Sahayak Sahakari, Ltd., Baroda.
The Hyderabad Book Depôt, Chaderghat, Hyderabad (Deccan).
Thakur & Co., Amraoti.

TABLE OF CONTENTS

	PAGE
(a) Harvesting Machinery	1
(b) Threshing Machinery	2

LIST OF ILLUSTRATIONS

- PLATE I, The Rajah Reaper.
- „ II, Self-binder fitted for road travel.
- „ III, Albion Self-binder cutting oats.
- „ IV, Marshall's 4'-6" Threshing Machine.

AGRICULTURAL IMPLEMENTS AND MACHINERY AT PUSA, PART II.

HARVESTING AND THRESHING IMPLEMENTS AND MACHINERY.

(Received for publication on 26th November, 1928.)

(a) Harvesting Machinery.

In India harvesting is practically all done by small hand sickles. At Pusa this can be done on contract from Rs. 3 to Rs. 3-8-0 per acre and includes cutting, tying and stooking. In tracts like the Punjab Canal Colonies, labour is much scarcer and the time is probably not far off when mechanical means will have to be resorted to for harvesting. The following machines have been tested at Pusa and have been found very successful but considerably more costly than local rates for hand work :—

1. The Rajah Reaper.
2. Thistle Reaper.
3. Albion Reaper.
4. Albion Reaper and Mower.
5. Albion Self-Binder and Reaper.

THE RAJAH REAPER.

(Plate I.)

The "Rajah" is a simple back-delivery machine. It is strongly made and has a wheel under the draft pole to facilitate working in irrigated land where there are small bunds. It will cut about 6 acres of cereals per day with two pairs of bullocks used alternately. The machine is sold by Messrs. Volkart Bros., Lyallpur ; price, Rs. 395.

ALBION SELF-BINDER.

(Plates II and III.)

The Albion Self-binder is a strong English made machine. It has done good work at Pusa, but the cost of twine is rather high. It must be pulled by a tractor as bullocks are too slow to give good results. The costs of work with the self-binder were :—

	Rs.
Cost of working tractor per acre	2.341
Cost of twine per acre	3.681
Cost of manual labour employed for stocking sheaf including men on the binder	0.387
Total per acre	6.309

This does not include depreciation on tractor and binder or interest on capital.

Best day's work, 10 acres ; average per day for the season, 7 acres.

(b) Threshing Machinery.

Threshing machinery at present is very little used in India, but it is difficult to see how the present conditions can continue in a wheat-growing tract where the price of labour is steadily increasing. The design of threshing machinery for India is a subject which requires a considerable amount of work. Conditions are different for most parts of the country and the wheat grain is hard, dry and brittle. Very high temperatures are experienced at threshing time when machinery is out in the open and subject to the full power of the sun. There will undoubtedly be a big opening for threshing machines when designers have produced the requisite article. Standard machines at present in the market cannot be said to be thoroughly satisfactory. Among the points to be considered are :—

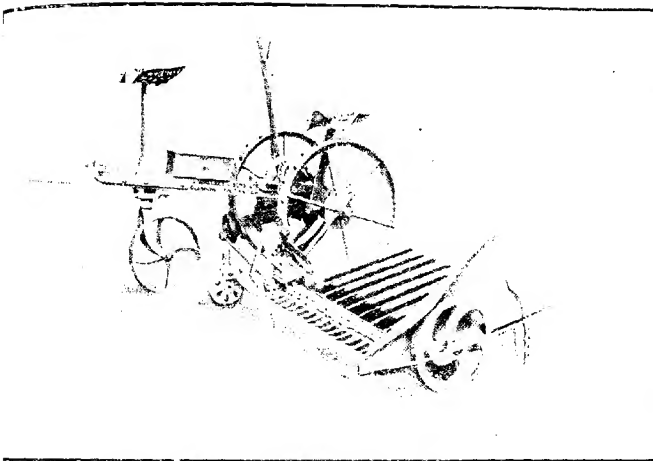
- (a) Indian wheat is exported with a high content of impurities.
- (b) A complete self-contained set is required, including a portable power unit.
- (c) Contractors might adopt a suitable combination if available, doing threshing by piece work as is done in other countries.
- (d) While the bullocks are treading out the grains on the threshing floor, they also manufacture *bhusa*. *Bhusa* is not simply cut straw ; it is the straw thoroughly smashed and broken up into small pieces. The *bhusa* problem has also to be considered.
- (e) Danger of fire must be considered ; straw blowers are somewhat risky in high temperatures.

MARSHALLS' 4'-6" THRESHING MACHINE.

(Plate IV.)

At Pusa the threshing problem is comparatively simple, as the chief cereal is oats. The standard machine here is a 4 ft. 6 inch-drum Marshalls' threshing machine with sheaf elevator and straw elevator. The sheaf elevator is of considerable practical importance as local labour is not strong enough to throw sheafs up to a high machine. Four hundred maunds of cleaned oats can be produced in a day. The price of the machine is Rs. 6,500.

PLATE L



The Rajah Reaper.

PLATE D.

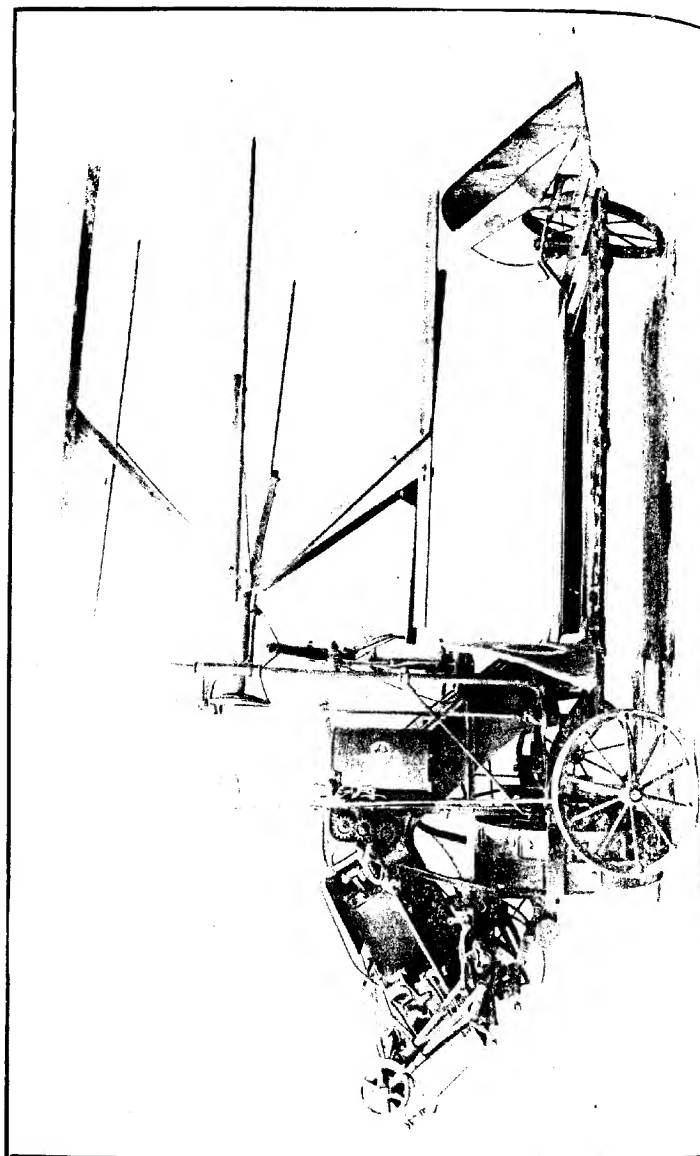
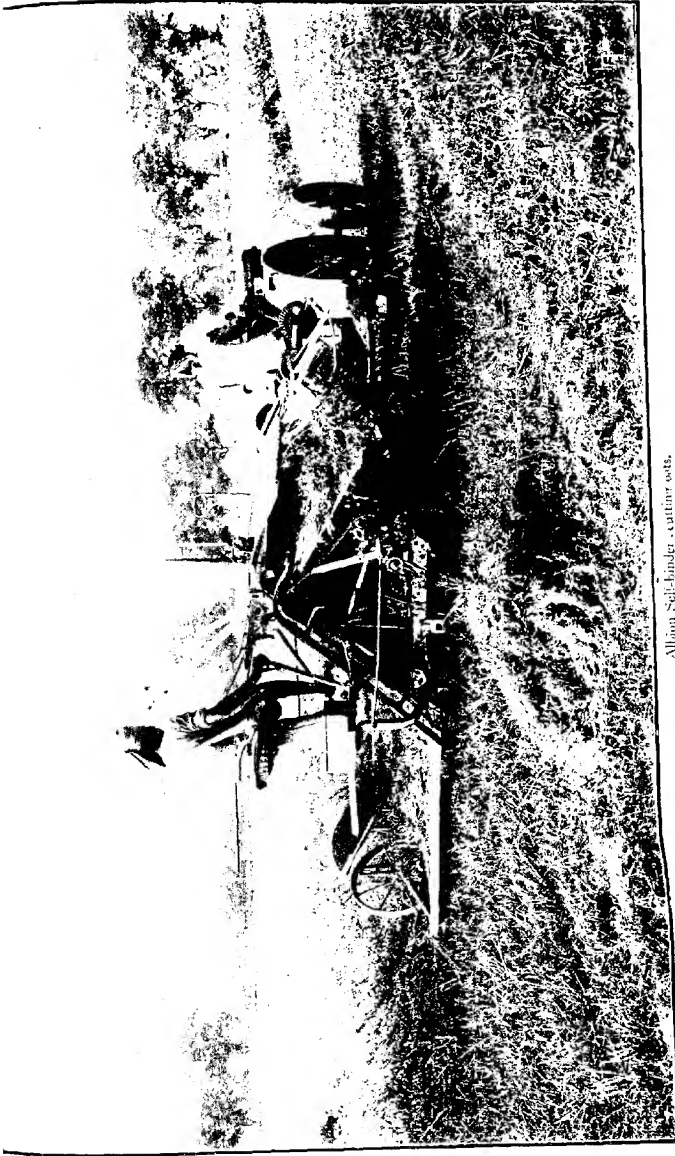
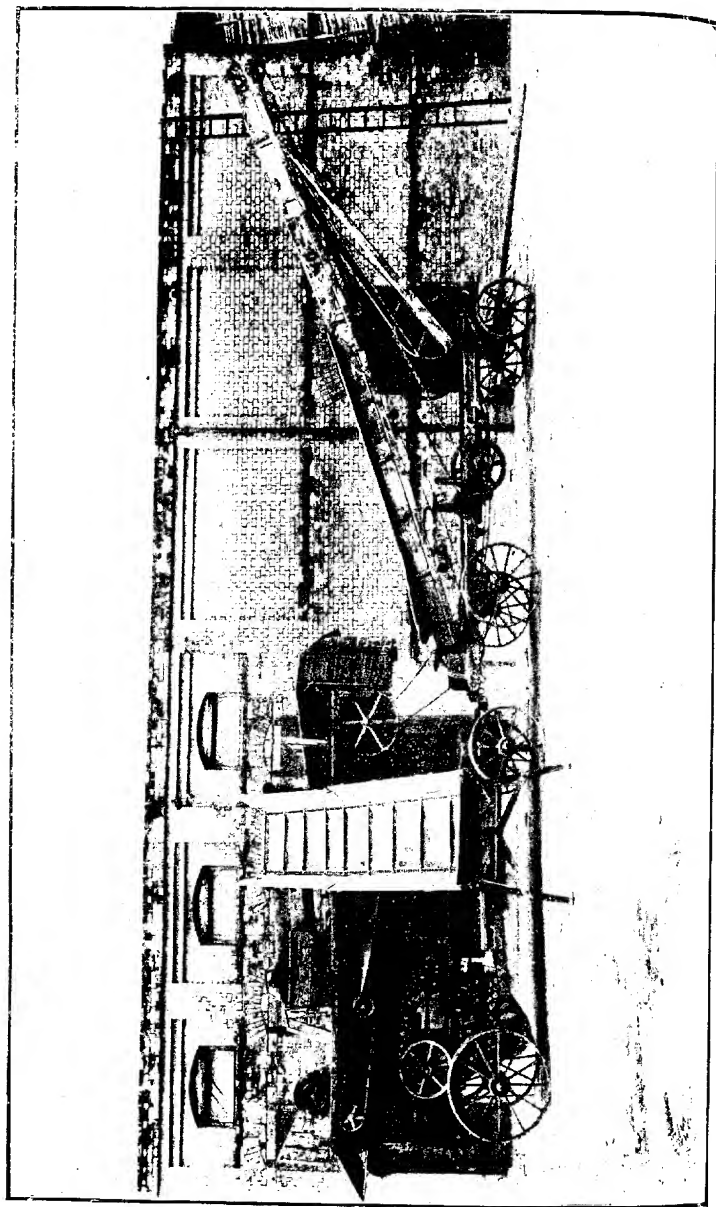


PLATE III.



Allison Self-kindling cutting machine.

PLATE IV.



Marshall's 4' 6" Hoisting Machine.

PUBLICATIONS OF THE IMPERIAL DEPARTMENT OF AGRICULTURE IN INDIA

TO BE HAD FROM

THE MANAGER, GOVERNMENT OF INDIA CENTRAL PUBLICATION BRANCH, IMPERIAL
SECRETARIAT BUILDING, 3, GOVERNMENT PLACE, WEST, CALCUTTA;

THE OFFICE OF THE AGRICULTURAL ADVISER TO THE GOVERNMENT OF
INDIA, PUSA, BIHAR;

AND

ALL AGENTS FOR SALE OF GOVERNMENT PUBLICATIONS.

A complete list of the publications of the Imperial Department of Agriculture in India can be obtained on application from the above-mentioned.

These publications are :—

1. *The Agricultural Journal of India*. A Journal dealing with subjects connected with agricultural economics, field and garden crops, economic plants and fruits, soils, manures, methods of cultivation, irrigation, climatic conditions, insect pests, fungus diseases, co-operative credit, farm implements, and other agricultural matters in India. Illustrations, including coloured plates, form a prominent feature of the Journal. It is edited by the Agricultural Adviser to the Government of India, and is issued once every two months or six times a year. *Annual subscription*, Rs. 6 or 9s. *Id.* including postage. Single copy Rs. 1-8 or 2s.
2. *The Journal of the Central Bureau for Animal Husbandry and Dairying in India*. A quarterly dealing with cattle-breeding, dairying, cultivation and storage of fodder crops, animal nutrition, and other aspects of animal husbandry. It is edited by the Agricultural Adviser to the Government of India. *Annual subscription*, Rs. 2-8. Single copy As. 10
3. *Scientific Reports of the Agricultural Research Institute, Pusa*
4. *Review of Agricultural Operations in India*.
5. *Proceedings of the Board of Agriculture in India*.
6. *Proceedings of Sectional Meetings of the Board of Agriculture*.
7. *Memoirs of the Imperial Department of Agriculture in India*.
 - (a) Botanical Series.
 - (b) Chemical Series.
 - (c) Entomological Series.
 - (d) Bacteriological Series.
 - (e) Veterinary Series.

8. *Bulletins issued by the Agricultural Research Institute, Pusa*.

9. *Books*.

The following are the publications of the last two years :—

Scientific Reports of the Agricultural Research Institute, Pusa (including the Reports of the Imperial Dairy Expert, the Physiological Chemist, Government Sugarcane Expert, and Secretary, Sugar Bureau), for the year 1926-27. Price, Rs. 1-14 or 3s. 3d.

Scientific Reports of the Agricultural Research Institute, Pusa (including the Reports of the Imperial Dairy Expert, Physiological Chemist, Government Sugarcane Expert, and Secretary, Sugar Bureau), for the year 1927-28. Price, Rs. 2-6 or 4s. 3d.

Review of Agricultural Operations in India, 1925-26. Price, Rs. 2-6 or 4s. 3d.

Review of Agricultural Operations in India, 1926-27. Price, Rs. 2 or 3s. 6d.

Proceedings of the Board of Agriculture in India, held at Pusa on 7th December, 1925, and following days (with appendices). Price, Rs. 1-14 or 3s. 3d.

1

Bull. Nos. 191, 192, 193 & 194.

MEMOIRS OF THE DEPARTMENT OF AGRICULTURE IN INDIA

Botanical Series

- Vol. XIV, No. IV. Studies in Gujarat Cottons, Part IV: Hybrids between Broach-desahi and Godan varieties of *Gossypium herbaceum*, by M. L. PATEL, M.A.G., and S. J. PATEL, B.A.G. Price, As. 14 or 1s. 6d.
- Vol. XIV, No. V. The Indigenous Cotton Types of Burma, by T. D. STOCK, B.Sc., D.L.C., A.R.C.S. Price, As. 9 or 10d.
- Vol. XIV, No. VI. A Study of *Puccinia* common to cotton plants and cotton soils in the Central Provinces, by JIWAN SINGH, M.Sc. Price, As. 5 or 6d.
- Vol. XIV, No. VII. The Kolamba Rice of the North Konkan and its Improvement by Selection, by R. K. BHADE and S. G. BHALERAO, B.A.G. Price, Rs. 1-4 or 2s.
- Vol. XIV, No. VIII. *Pennisetum typhoides*: Studies on the Bajri Crop. 1. The Morphology of *Pennisetum typhoides*, by S. V. GODBOLE, M.Sc., B.A.G. Price, As. 12 or 1s. 3d.
- Vol. XV, No. I. Studies in Khandesh Cotton, Part I, by S. H. PHAYAO, M.A.G. Price, Rs. 1-3 or 2s. 3d.
- Vol. XV, No. II. The Indian Types of *Lathyrus sativus* L. (Khesari, Lakh, Lang, Teora), by GABRIELLE L. C. HOWARD, M.A., and K. S. ABDUR RAHMAN KHAN. Price, Rs. 1-8 or 2s. 6d.
- Vol. XV, No. III. Fruit-Rot Disease of Cultivated Cucurbitaceae caused by *Phythium aphanispermum* (Eds.) Fitz., by M. MITRA, M.Sc., F.L.S., and L. S. SUBRAMANIAM, F.L.S. Price, As. 6 or 8d.
- Vol. XV, No. IV. Colour Inheritance in Rice, by S. K. MITRA, M.S., Ph.D., and S. N. GUPTA and P. M. GANGULI. Price, As. 6 or 8d.
- Vol. XV, No. V. *Asterina* spp. from India determined by Dr. RUTH RYAN and *Meliola* spp. from India and one from Malay determined by Prof. F. L. STEVENS. Price, As. 5 or 5d.
- Vol. XV, No. VI. Studies on Rice in Sind, Part I, by K. I. THADANI, M.Sc., and H. V. DUTTA, B.Sc. Price, Rs. 1 or 1s. 9d.
- Vol. XV, No. VII. Variability in certain economic characters particularly in seed weight and weight of lint per seed in pure strains of Broach Deshi Cotton, by MADANLAL L. PATEL, M.A.G., and HAROLD H. MANN, D.Sc. Price, As. 14 or 1s. 9d.
- Vol. XV, No. VIII. Studies in the Shedding of Mango Flowers and Fruits, Part I, by P. V. WAGLE, M.A.G. Price, As. 11 or 1s. 3d.
- Vol. XVI, No. I. Studies in the *Jowars* of Gujarat: 1. The *Jowars* of the Surat District, by M. L. PATEL, M.A.G., and G. B. PATEL, B.A.G. Price, Rs. 1-6 or 2s. 3d.
- Vol. XVI, No. II. Studies in Indian Chillies, I: The Types of Capsicum, by F. J. F. SHAW, D.Sc., A.R.C.S., F.L.S., and KHAN SAHIB ABDUR RAHMAN KHAN. Price, Rs. 1-3 or 2s. 6d.
- Vol. XVI, No. III. Foot-rot and wilt of Antirrhinums caused by *Phytophthora mini* var. *antirrhini* n.v., by S. SUNDARARAMAN, M.A., and T. S. RAMAKRISHNAN, M.A. Price, Rs. 1 or 1s. 9d.
- Vol. XVI, No. IV. Further studies of Indian Grasses and Grass-lands, by W. BURNS, D.Sc. (Edn.), L. B. KULKARNI, M.A.G. (Bom.), and S. R. GODBOLE, B.Sc. (Bom.). Price, Rs. 1-4 or 2s. 3d.
- Vol. XVI, No. V. Studies of Sugarcane roots at different stages of growth, by RAO BAHADUR T. S. VENKATRAMAN, B.A., and R. THOMAS. Price, As. 13 or 1s. 6d.
- Vol. XVI, No. VI. Studies in Indian Pulses: 1. Lentil (*Ervum lens* Linn.), by F. J. F. SHAW, D.Sc., A.R.C.S., F.L.S., and RAHUL DAS BUSE, B.Sc. Price, Rs. 1-10 or 2s. 6d.
- Vol. XVI, No. VII. *Phythium aphanispermum* (Eds.) Fitz. on *Opuntia Dillenii*, Haw., by T. S. RAMAKRISHNA AYYAR, M.A. Price, As. 8 or 10d.
- Vol. XVII, No. I. Non-dehiscence of anthers in Punjab American Cottons by TREVOR PROCTOR, M.A. Price, As. 4 or 5d.
- Vol. XVII, No. II. Studies in the Wilt Disease of Cotton in the Bombay Karnatak, Series I, by G. S. KULKARNI, M.A.G., and B. B. MUNDKUR, M.A.; with an Introduction by Dr. H. H. MANN. Price, As. 9 or 1s.

Chemical Series

- Vol. IX, No. III. Some Digestibility Trials on Indian Feeding Stuffs, II, by P. E. LANGE, M.A., D.Sc., A.R.C., and PANDIT LAL CHAND DHARMANI, L.A.G., B.Sc. (Ag.). Price, As. 10 or 1s.
- Vol. IX, No. IV. The Effect of Manuring a Crop on the Vegetative and Reproductive Capacity of the Seed, by B. VISWANATH, F.R.C., and M. SUBANARAYANA, B.Sc. Price, As. 1-3 or 1s. 6d.
- Vol. IX, No. V. Experiments on the Feeding of Sorghum silage and concentrate to Sindhi cattle, by F. J. WARTZ, M.Sc., and SHARI KANT MISRA. Price, As. 9 or 10d.

Chemical Series—*contd.*

- Vol. IX, No. VI. **Losses and gains of Nitrogen in an Indian Soil studied in relation to the seasonal composition of well waters, and the bearings of the results on the alleged deterioration of soil fertility**, by HAROLD E. ANNETT, D.Sc., F.I.C., M.Sc., F.A.C.O., A. PADMANABHA AYYAR, B.A., and RAM NARAYAN KAVASTH, M.Sc., B.A.G. Price, Rs. 2 or 3s. 6d.
- Vol. IX, No. VII. **Some Digestibility Trials on Indian Feeding Stuffs, Part III: Some Punjab Hays**, by P. E. LANDER, M.A., D.Sc., A.I.C., and FANDIT LAL CHAND DHARMANI, L.A.G., B.Sc. (Ag.). Price, As. 5 or 6d.
- Vol. IX, No. VIII. **The determination of the Electrical Conductivity of the aqueous Extract of Soil as a rapid means of detecting its probable Fertility**, by ASHUTOSH SEN, M.Sc. Price, As. 4 or 6d.
- Vol. X, No. I. **Feeding Experiments at Karnal**, by F. J. WARTH, M.Sc., and F. J. GOSWIP. Price, As. 3 or 10d.
- Vol. X, No. II. **Soils of the Punjab**, by DR. P. E. LANDER, M.A., D.Sc., A.I.C., DR. RAMJI NARAIN, D.Sc., and MEHTA MOKAND LAL, B.Sc., L.A.G. Price, Rs. 3-14 or 6s. 9d.

Entomological Series

- Vol. X, Nos. I. & II. **Four New Indian Gall Midges**, by DR. E. P. FELT; The Citrus Psylla (*Diaphorina citri*, Kuw.), by M. AFZAL HUSAIN, M.Sc., M.A. Price, Re. 1-2 or 2s.
- Vol. X, No. III. **Braconidae Viploninae of South India**, by T. V. RAMAKRISHNA AYYAR, B.A., F.R.S., F.Z.S. Price, As. 14 or 1s. 3d.
- Vol. X, No. IV. **Some New Indian Miridae (*Captidae*)**, by E. BAUMARD, B.A., F.R.S. Price, As. 6 or 8d.
- Vol. X, No. V. **The use of Hydrocyanic Acid Gas for the Fumigation of American Cotton on import into India. Experiments on its lethal power for the Mexican Boll-weevil (*Anthonomus grandis*) and for the Grain-weevil (*Sitophilus gryseus*); on the extent to which it is absorbed by Cotton and Jute respectively; and on a practical method for satisfactory fumigation on a large scale**, by A. JAMES TURNER, M.A., B.Sc., and D. L. SEN, M.Sc. TECH., M.Sc., with a Foreword by B. C. BURT, M.B.E., B.Sc. Price, Rs. 2 or 3s. 9d.
- Vol. X, No. VI. **Studies on *Platyedra gossypiella*, Saunders (Pink bollworm)**, in the Punjab, by SOHAN SINGH BINDRA, M.Sc. Price, Re. 1-4 or 2s. 7d.
- Vol. X, No. VII. **A Contribution to our knowledge of the Thysanoptera of India**, by T. V. RAMAKRISHNA AYYAR, Ph.D., F.R.S., F.Z.S. Price, Re. 1-9 or 2s. 6d.
- Vol. XI, No. I. **A List of the Generic Names used for Microlepidoptera**, by T. RAINBRIDGE FLETCHER, B.N., F.L.S., F.R.S., F.Z.S. (*in the press*).

Bacteriological Series

- Vol. II, No. II. **A Bacterial Soft Rot of Garden Poppy**, by C. S. RAM AYYAR, B.A. Price, As. 5 or 6d.
- Vol. II, No. III. **Nitrification of Calcium Cyanamide in some Indian Soils**, by J. H. WALTON, M.A., M.Sc. Price, As. 10 or 1s.

Veterinary Series

- Vol. IV, No. I. **The Chemotherapy of Surra (*Trypanosoma evansi* Infections) of Horses and Cattle in India**, by J. T. EDWARDS, D.Sc., M.R.C.V.S. Price, Rs. 4-2 or 7s.
- Vol. IV, No. II. **Studies in Bovine Lymphangitis**, by V. KRISHNAMURTHI AYYAR. Price, Re. 1-2 or 2s.
- Vol. IV, No. III. **Trypanblue and certain diithio-aniline derivatives: their efficacy in the treatment of Piroplasmiasis and other affections in the Central Provinces**, by Major R. F. STIRLING, F.R.C.V.S., D.V.S.M., F.Z.S., I.V.S. Price, As. 3 or 4d.
- Vol. IV, No. IV. **Nasal Granuloma in Cattle in Bihar and Orissa**, by RAI SAHIB P. N. DAS. Price, As. 3 or 4d.

Bulletins issued by the Agricultural Research Institute, Pusa.

- No. 166. **Sampling for Rice Yield in Bihar and Orissa**, by J. A. HURBACK, I.C.S. Price, As. 7 or 9d.
- No. 167. **A Scheme of Classification of the Varieties of Rice Found in Burma**, by R. A. BEALE. Price, As. 6 or 8d.
- No. 168. **List of Publications on Indian Entomology, 1926 (compiled by the Offg. Imperial Entomologist and the Imperial Entomologist)**. Price, As. 10 or 1s.
- No. 169. **The Stem-bleeding Disease of Arecanut (*Areca catechu*) caused by *Thielaviopsis paradoxa* Von Hon.**, by S. SUNDARARAMAN, M.A., C. KRISHNAN NAYAR and T. S. RAMAKRISHNAN, M.A. Price, As. 9 or 1s.
- No. 170. **Seasonal Variations in the Germ Content of Milk at Pusa**, by J. H. WALTON, M.A., M.Sc. Price, As. 6 or 8d.

Bulletins issued by the Agricultural Research Institute, Pusa—contd.

- No. 171. The Improvement of Indian Wheat. A Brief Summary of the Investigations carried out at Pusa from 1905 to 1924, including an account of the new Pusa Hybrid, by ALBERT HOWARD, O.F.E., M.A., and GABRIELLE L. C. HOWARD, M.A. Price, As. 8 or 10d.
- No. 172. The Mechanical Analysis of Tropical Soils, by J. CHARLTON, M.Sc., F.I.C. Price, As. 3 or 4d.
- No. 173. Occurrence of Trichomonad Flagellates in the blood stream of Fowls, by HUGH COOPER, M.R.C.V.S., and AMAR NATH GULATI, M.Sc. Price, As. 3 or 4d.
- No. 174. Unit System for Farm Buildings, by G. S. HENDERSON, N.D.A., N.D.D. Price, As. 5 or 6d.
- No. 175. A Comparative Study of the methods of preparation of the Soil for the Mechanical Analysis, with a Note on the Pipette Method, by AMAR NATH GOBI, Ph.D., and B. M. AMIN, B.A. Price, As. 4 or 6d.
- No. 176. A Method of increasing the Manurial Value of *Mahua* Cake, by N. D. VYAS, L.A.G. Price, As. 4 or 6d.
- No. 177. Root-rot and Sclerotial Diseases of Wheat, by L. S. SUBRAMANIAM, F.L.S. Price, As. 4 or 5d.
- No. 178. A Study of the Locular Composition in Cambodia Cotton, by V. RAMANATHAN, L.A.G. Price, As. 7 or 8d.
- No. 179. A Leaf Spot and Blight Disease of Onions, caused by *Alternaria palandui* nov. sp., by C. RANGASWAMI AYYANGAR. Price, As. 6 or 8d.
- No. 180. Stem-rot of Berseem, caused by *Rhizoctonia Solani* Kühn, by MD. TASLIM. Price, As. 8 or 10d.
- No. 181. Life History, Bionomics and Control of *Mylocerus maculosus*, Desb. (Curculionidae: Coleoptera), by KIDAR NATH TRIHAN, M.Sc. Price, As. 14 or 1s. 6d.
- No. 182. Investigations in the Bacteriology of Silage (1926-27), by J. H. WALTON, M.A., M.Sc. Price, As. 5 or 6d.
- No. 183. A Milk Fermenting Yeast, by C. S. RAM AYYAR, B.A. Price, As. 5 or 6d.
- No. 184. List of Publications on Indian Entomology, 1927. (Compiled by the Imperial Entomologist.) Price, As. 6 or 9d.
- No. 185. The Cultivation of Lac in the plains of India, *Laccifera lacca*, Kerr., by C. S. MISRA, B.A. (Revised Edition.) Price, Rs. 4 or 6s. 9d.
- No. 186. A Preliminary Note on the Rice crop in the United Provinces, by R. L. SETHI. Price, As. 7 or 9d.
- No. 187. The Production of Cigarette Tobacco by Flue-Curing, by F. J. F. SHAW, D.Sc., A.R.C.S., F.L.S., and KASHI RAM. Price, Rs. 1 or 1s. 9d.
- No. 188. Designs for Farm Buildings, by G. S. HENDERSON, N.D.A., N.D.D. Price, As. 6 or 8d.
- No. 189. The Improvement of Dharwar-American Cotton by Hybridization, by R. K. KULKARNI, B.A.G., and T. R. KHADILKAR, B.A.G. Price, Rs. 2-2 or 4s.
- No. 190. Description of a New species, *Dipylidium catus* n. sp., with a Note on the Genus *Dipylidium* Leuckart, 1863, by AMAR NATH GULATI, M.Sc. Price, As. 6 or 8d.
- No. 191. Agricultural Implements and Machinery at Pusa, Part I: Cultivation Implements and Machinery, by G. S. HENDERSON, N.D.A., N.D.D., and ARJUN SINGH, L.A.G. Price As. 12 or 1s. 3d.
- No. 192. Agricultural Implements and Machinery at Pusa, Part II: Harvesting and Threshing Implements and Machinery, by G. S. HENDERSON, N.D.A., N.D.D., and ARJUN SINGH, L.A.G. Price, As. 6 or 8d.
- No. 193. Agricultural Implements and Machinery at Pusa, Part III: Special and Miscellaneous Implements and Machinery, by G. S. HENDERSON, N.D.A., N.D.D., and ARJUN SINGH, L.A.G. Price, As. 6 or 1s.
- No. 194. Agricultural Implements and Machinery at Pusa, Part IV: Power Implements and Machinery, by G. S. HENDERSON, N.D.A., N.D.D., and ARJUN SINGH, L.A.G. Price As. 12 or 1s. 3d.

Books

- Wheat in India, by ALBERT HOWARD, M.A., A.R.C.S., F.L.S., and GABRIELLE L. C. HOWARD, M.A. Price, Rs. 5 or 7s. 6d.
- A Description of the Imperial Bacteriological Laboratory, MUKTESAR; Its Work and Products, by MAJOR J. D. E. HOLMES, M.A., D.Sc., M.R.C.V.S. Price, As. 8 or 9d. Hindi and Urdu Editions, Rs. 2-4 each.
- Agriculture in India, by JAMES MACKENNA, M.A., L.C.S. Price, As. 4 or 5d.
- Some Diseases of Cattle in India. A Handbook for Stock-owners. (Revised in 1927.) Price, Rs. 1-4 or 2s.
- Report on the Diseases of Silkworms in India, by A. PRINGLE JAMESON, D.Sc. Price, Rs. 3.
- The Importance of Bacterial Action in Indigo Manufacture, by G. M. HUTCHINSON, B.A. Price As. 2.

Notice

All new publications are included in the above list and are regularly posted to all on the mailing list as soon as issued. Unless complaints of non-receipt of any publication are received by the Manager, Government of India Central Publication Branch, Imperial Secretariat Building, 3, Government Place, West, Calcutta, within six months of the date of issue, duplicate copies can be supplied only on payment of cost and postage.

